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Using passive acoustics to monitor Galiano glass sponge reef

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Speaker

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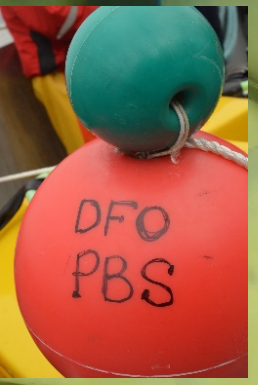

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What are glass sponge reefs?

- Built by Hexactinellid (glass) sponges
- Nursery habitat for rockfish
- Ecosystem similar to coral reefs
- Depth range: 25 - 270 m

Farrea occa

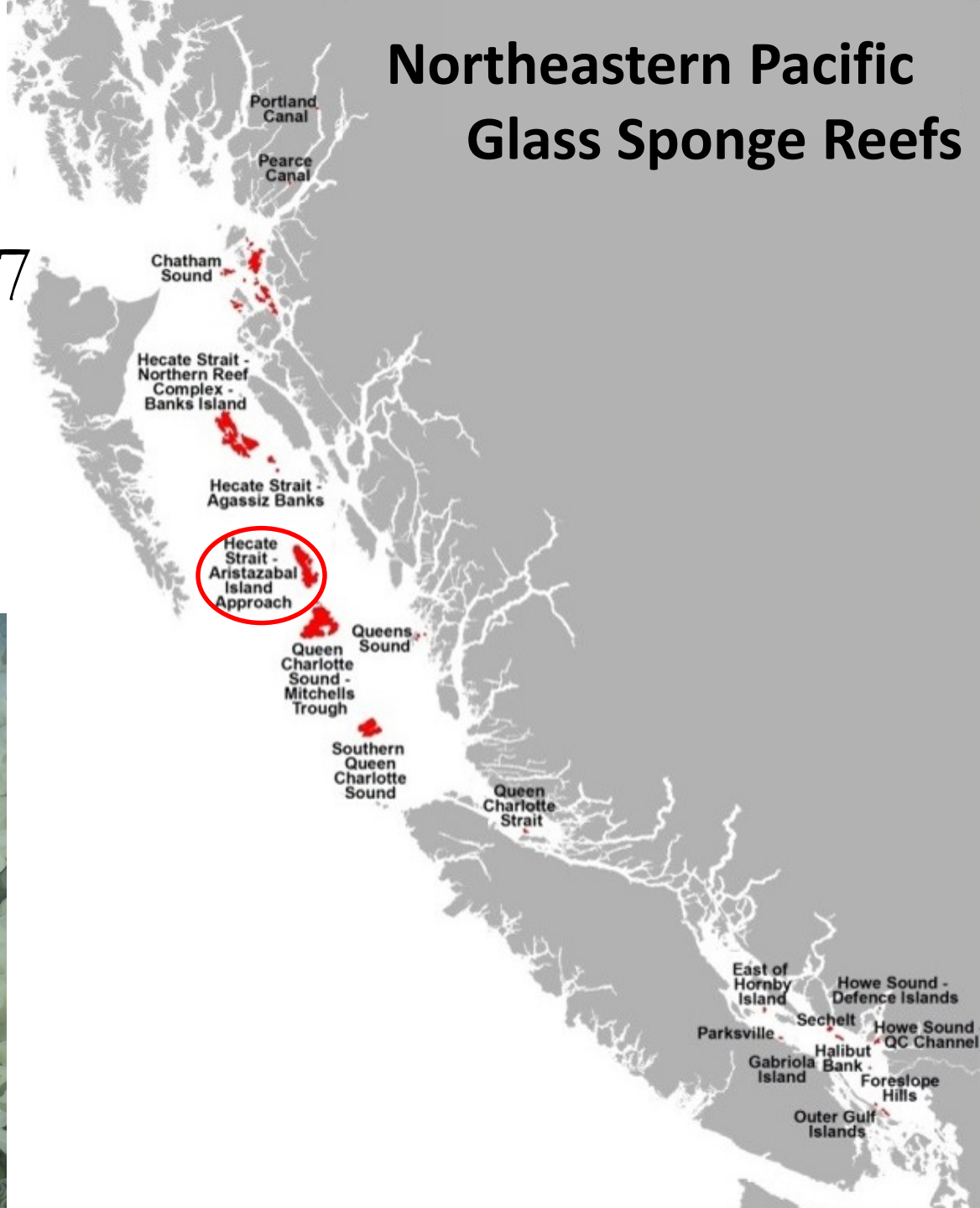
Heterochone calyx

Aphrocallistes vastus

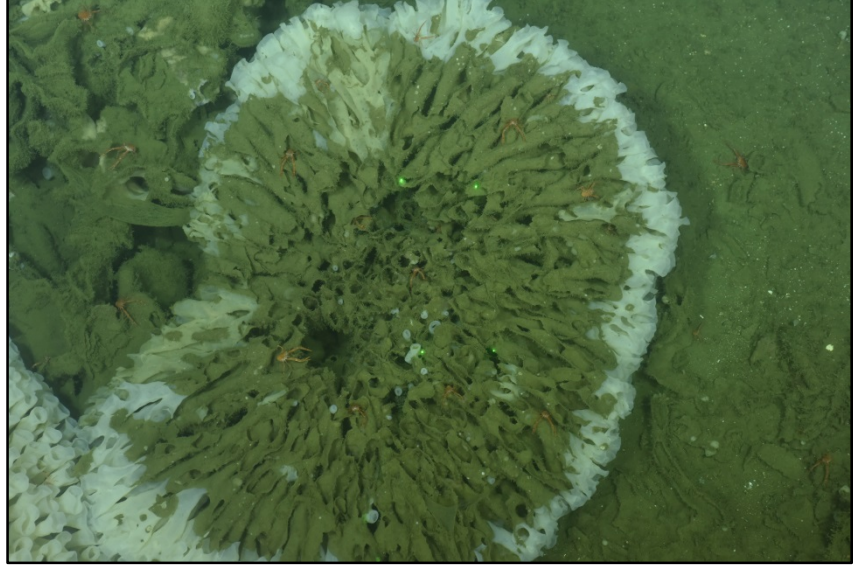
Slide courtesy of S. Archer & A. Dunham

- Common 200 MYA, believed extinct 40 MYA
- Discovered in Hecate Strait in 1987
- More exist from the Strait of Georgia to Alaska

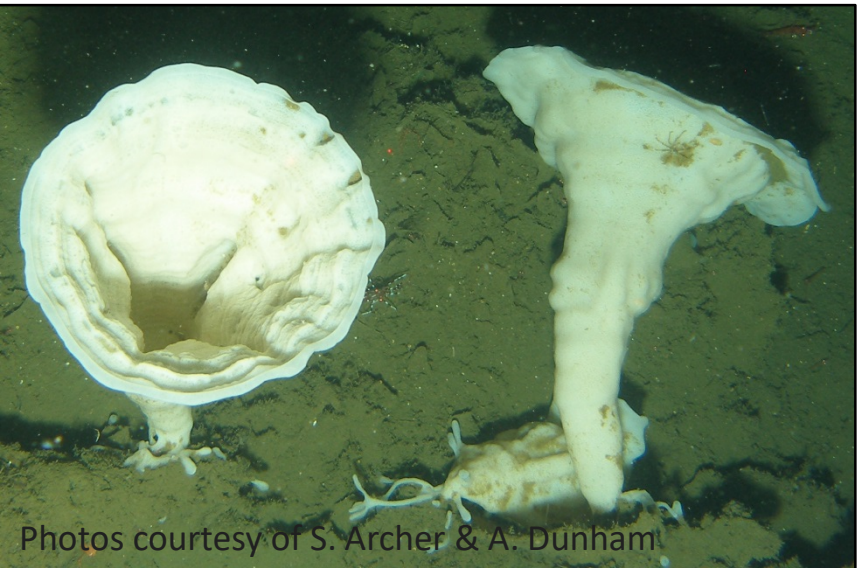
Photo courtesy of S. Archer & A. Dunham



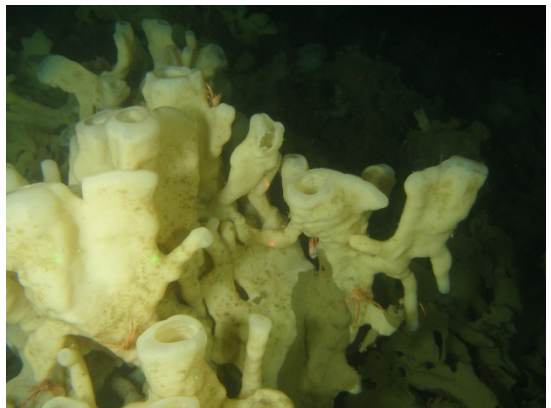
- Require a suite of very specific conditions for growth



- Slow growth rate (1-9 cm/year)



Photos courtesy of S. Archer & A. Dunham



Why are they important?

Photo courtesy of S. Archer & A. Dunham

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1. Historical value

Photo courtesy of S. Archer & A. Dunham

Why are they important?

1. Historical value
2. **Ecological value**

Photo courtesy of S. Archer & A. Dunham

Slide courtesy of S. Archer & A. Dunham

Kahn et al. 2016

Cook et al. 2008, Chu and Leys 2010, Dunham et al. 2015

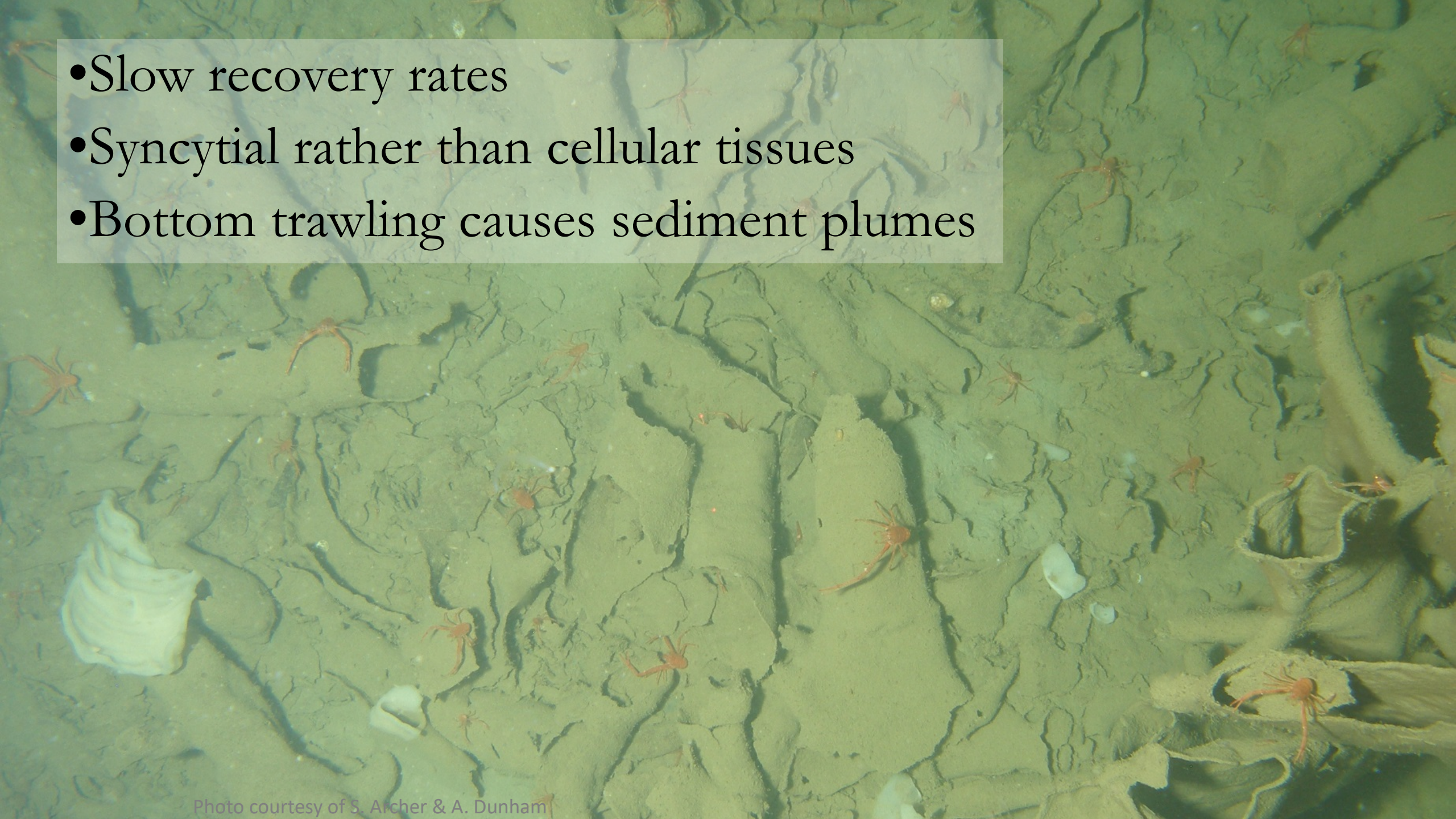
Slide courtesy of S. Archer & A. Dunham

Why are they important?

1. Historical value
2. Ecological value
3. **Economic value**

Why are they in trouble?

Photo courtesy of S. Archer & A. Dunham



- Slow recovery rates
- Syncytial rather than cellular tissues
- Bottom trawling causes sediment plumes

Photo courtesy of S. Archer & A. Dunham

Photo courtesy of S. Archer & A. Dunham

How can Bioacoustics help?

Photo courtesy of S. Archer & A. Dunham

Objectives of the Study

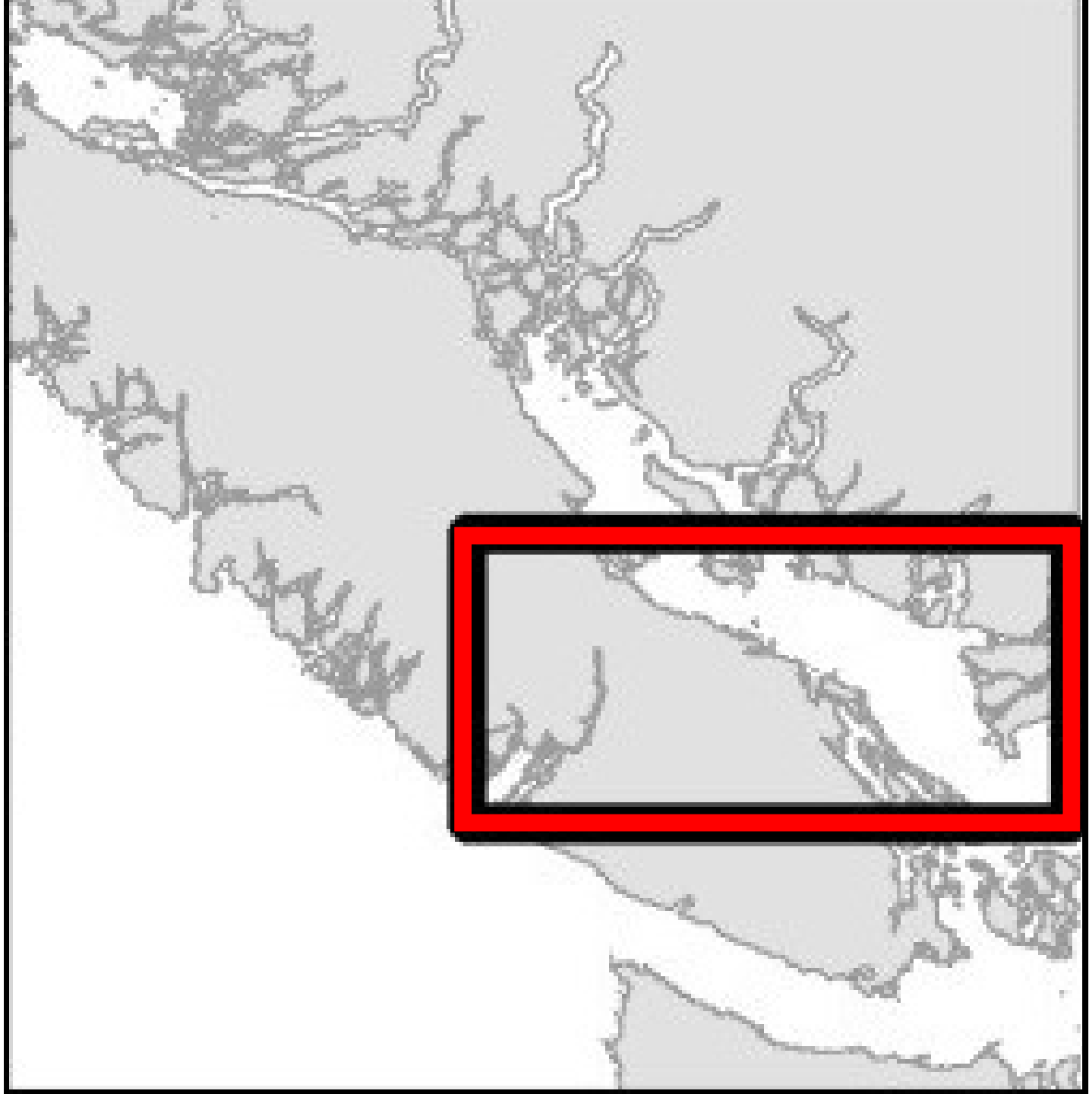
1. Do GSRs (Glass Sponge Reefs) have a distinct biophony? What do they sound like?
2. What levels of vessel noise are GSRs exposed to?
3. Can Passive Acoustics be used to monitor GSR ecosystem health?

Photo courtesy of S. Archer & A. Dunham

Study Area

Galiano Glass Sponge Reef in the Outer Gulf Islands

Slide courtesy of S. Archer & A. Dunham



Archer *et al.* (in press)

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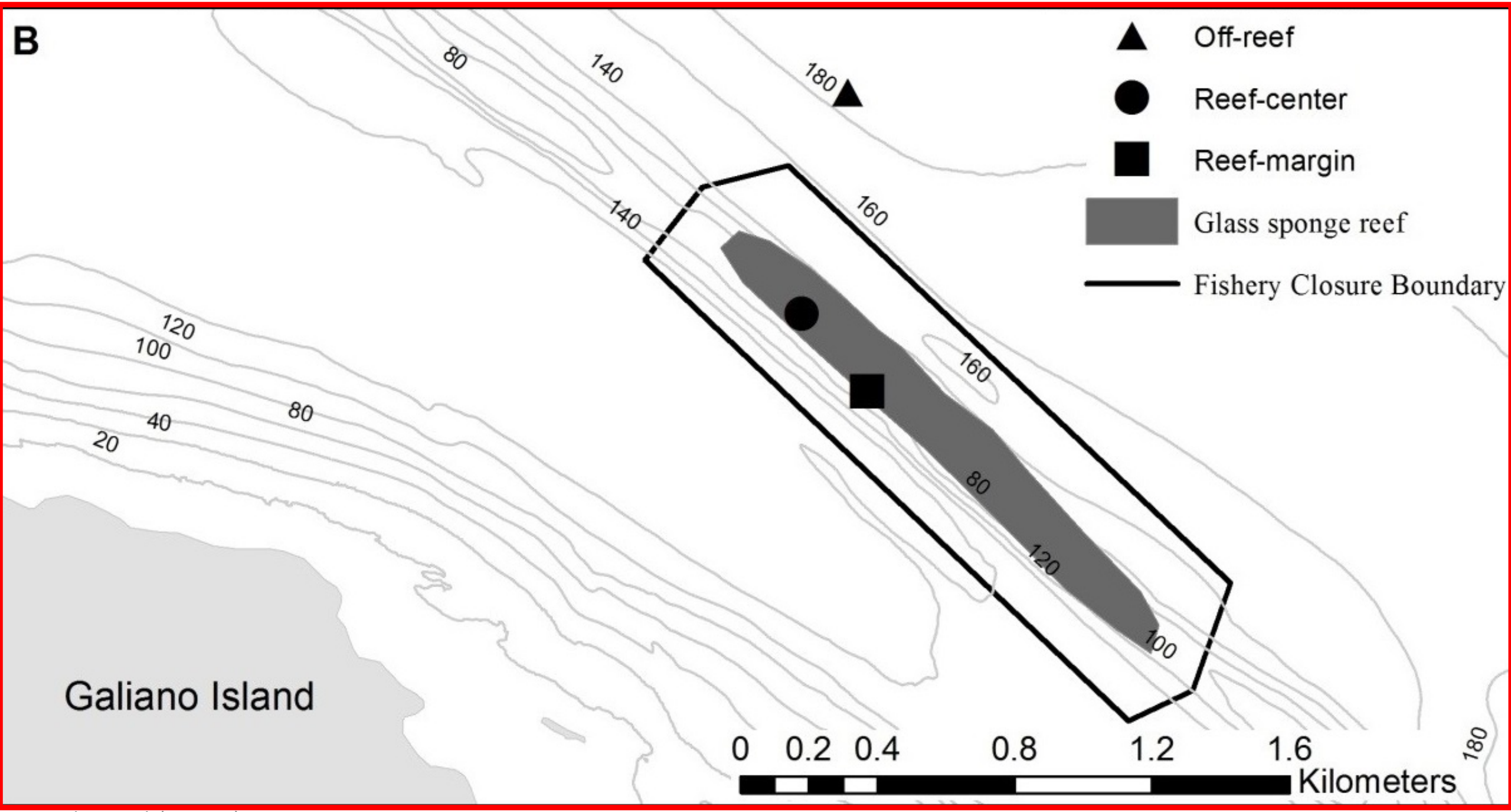

Archer *et al.* (in press)


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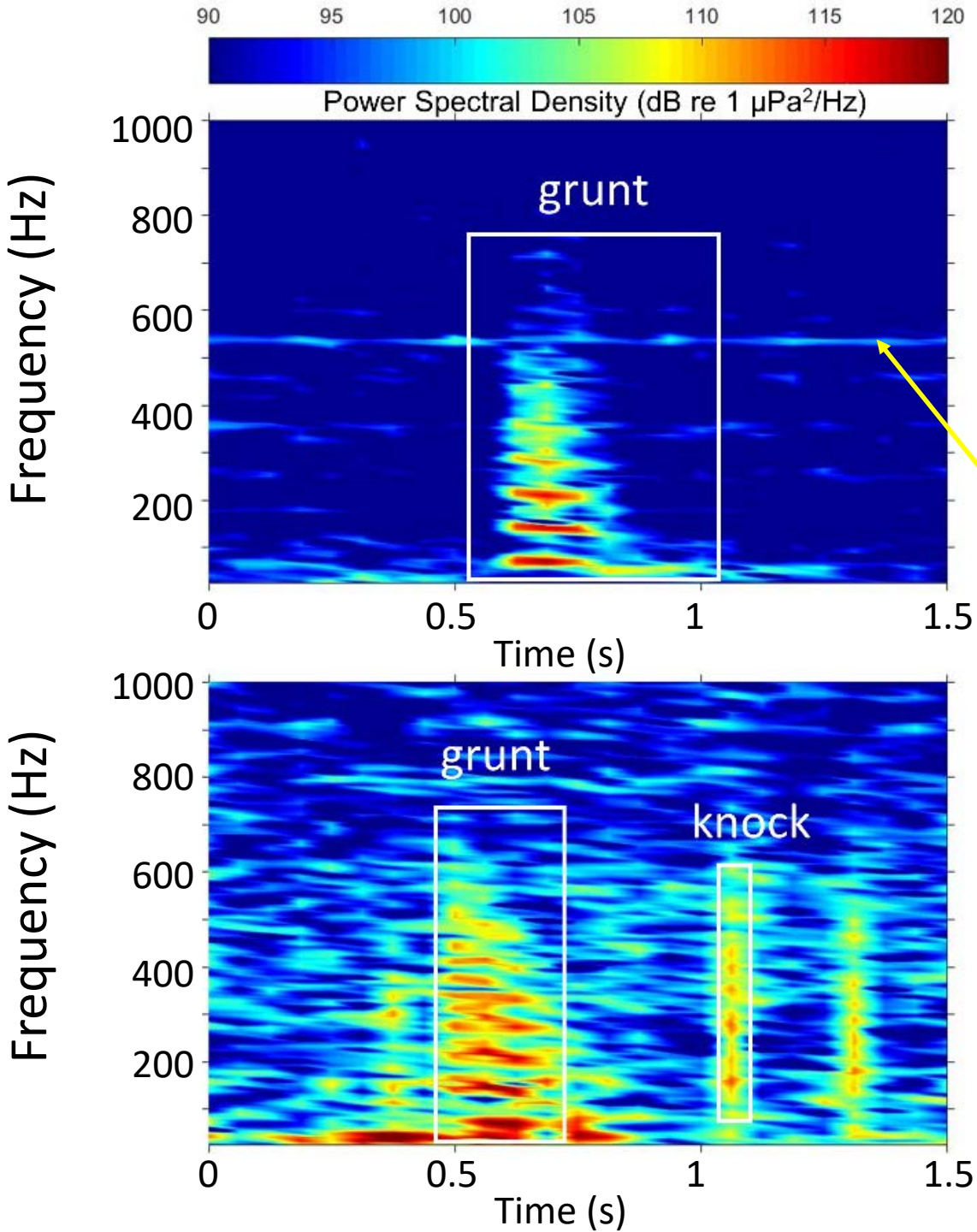
3 Sound Traps deployed in Sept 2016 (for 4-5 days)

Continuous duty cycle (96 kHz, 16 bit)

3966 recordings (5 minutes each)



Fish sounds

Reef-center: 41

Reef-margin: 120

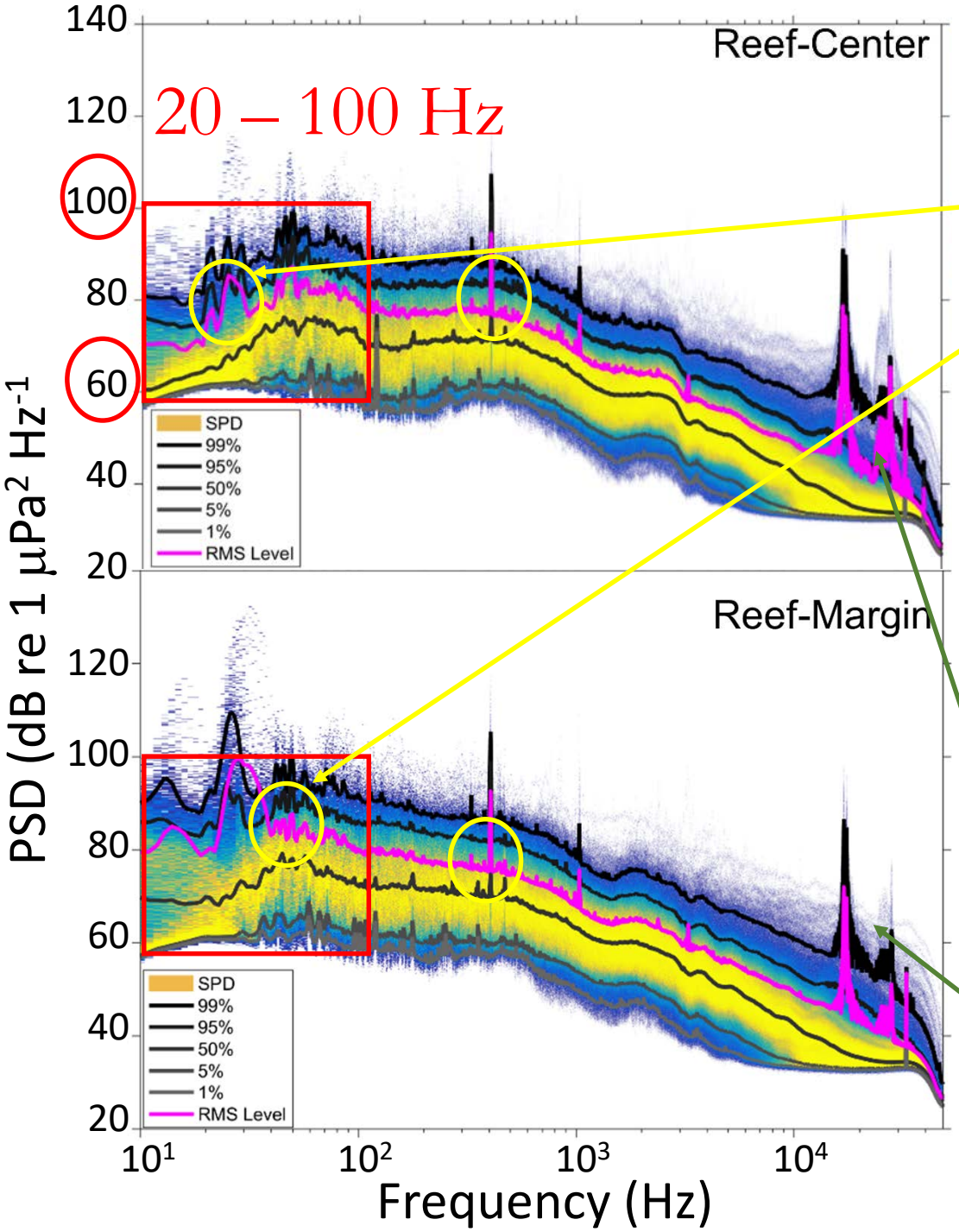
off-reef site: 7

Ship noise

"Quiet"

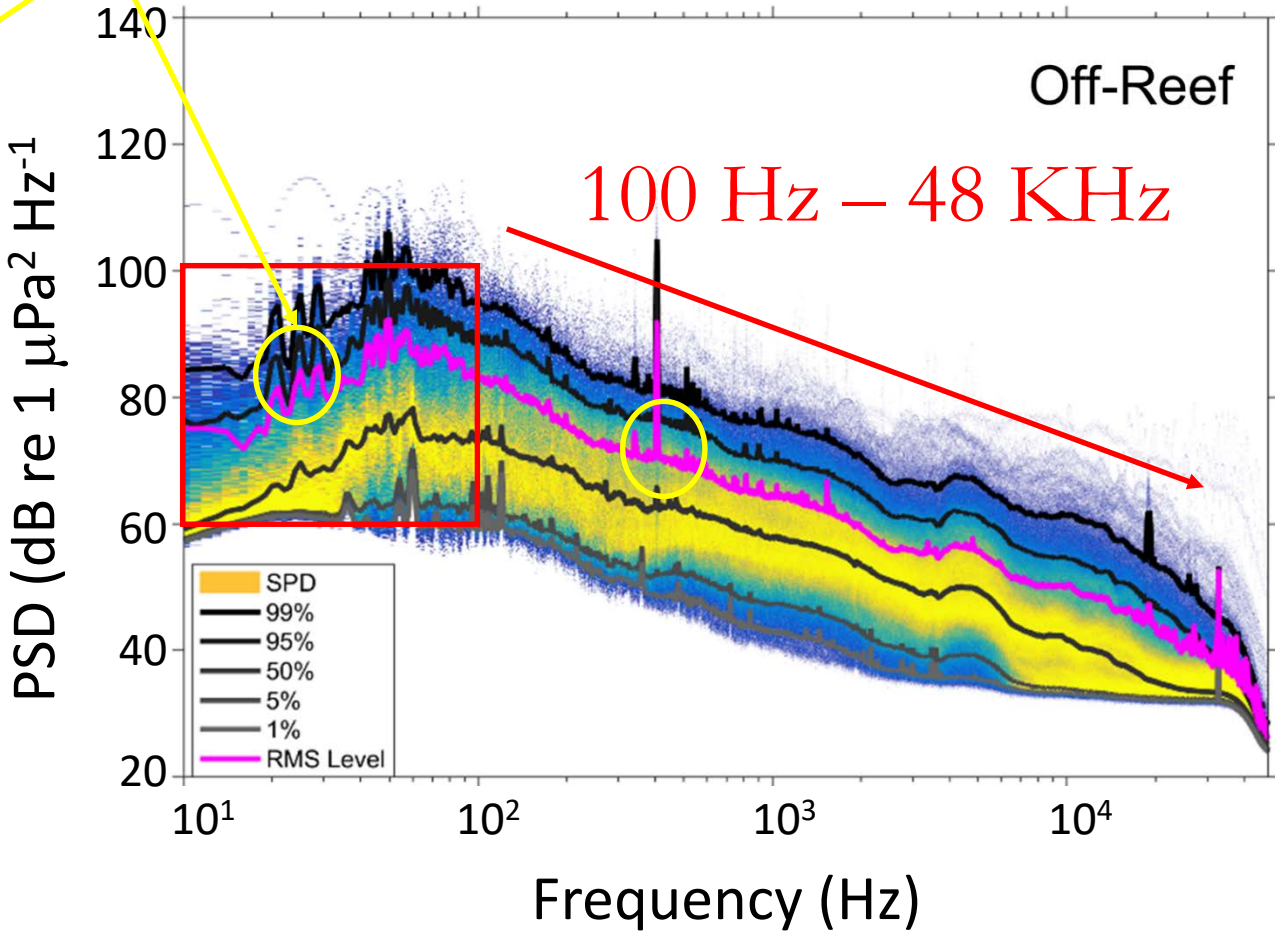
"Noisy"

Archer *et al.* (in press)

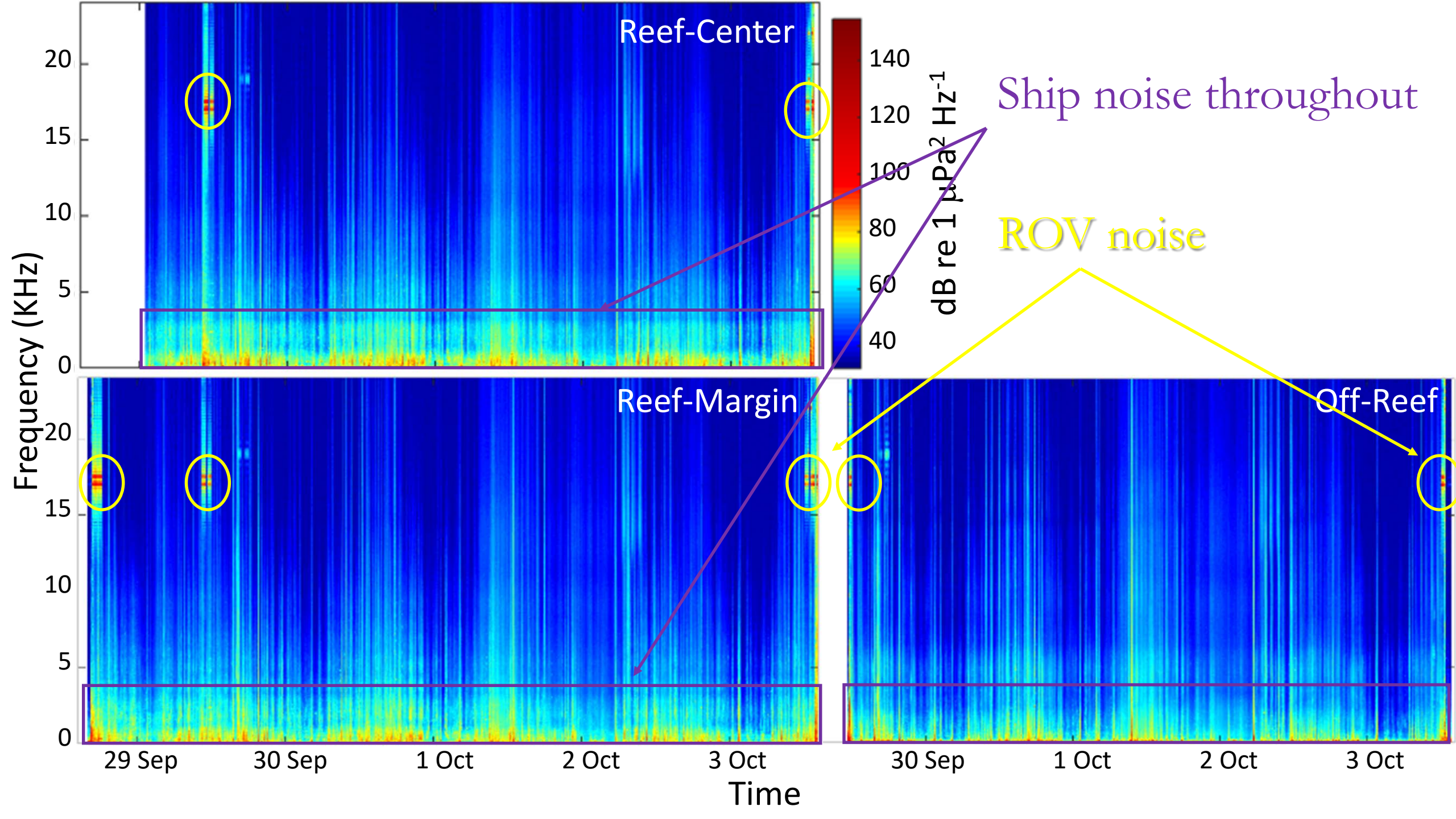


Peaks for shipping noise

Largest from propeller cavitation



Peaks 10-20 KHz from ROV noise


Reef-Center
Reef-Margin
Off-Reef
Ship noise throughout
ROV noise
Frequency (KHz)
0
5
10
15
20
140
120
100
80
60
40
dB re 1 µPa² Hz⁻¹
29 Sep
30 Sep
1 Oct
2 Oct
3 Oct
Time

Summary of counts of vessels within 10 km of each recorder and the distance (m) of the closest vessel to each recorder for each minute of recording.

No difference between locations

Location	Minimum	Median	Maximum
Number of Vessels			
Reef-Center	0	2	8
Reef-Margin	0	2	8
Off-Reef	0	2	8
Minimum Distance			
Reef-Center	14	4952	9998
Reef-Margin	19	5122	10653
Off-Reef	8	4800	10262

0-8 vessels PER MINUTE

From 10 Km away … to RIGHT ON TOP

Archer *et al.* (in press)

Species observed during recorder deployment and retrieval at each location.

Off-reef	Reef-margin	Reef-Center
No species observed	*Cribrinopsis fernaldi*	*Acantholithodes hispidus*
	Crossaster papposus	*Chorilia longipes*
	Hydrolagus colliei	*Gephyreaster swifti*
	Metridium sp.	*Henricia sp.*
	Munida quadrispina	Unidentified Lithodidae sp 1.
	Pandalus platyceros	*Munida Quadrispina*
		Unidentified Osmeridae sp 1.
0	6	*Pandalus platyceros* 13
		Peltodoris lentiginosa
		Sebastes elongatus
		Sebastes sp. 1
		Sebastes sp. 2
		Unidentified Asteroidea sp. 1

Archer *et al.* (in press)

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Conclusions

1. This Glass GSR has a distinct biophony. More fish sounds were detected on the GSR.
2. Vessel traffic increased noise levels on the GSR.
3. Passive acoustics may complement traditional visual surveys.

Future Work

- Longer deployments + fine-scale community mapping to investigate temporal changes
- Identify fish calls to species level
- Impact of vessel noise on the community?
- Relationship between sound production, community structure, and ecosystem health?

Photo courtesy of S. Archer & A. Dunham

Thank you!!!

Questions?

S. Archer, W. Halliday, A. Riera, X. Mouy, M. Pine, A. Dunham, F. Juanes. January 2018. The first description of a glass sponge reef soundscape reveals fish calls and elevated sound pressure levels, Marine Ecology Progress Series. DOI: 10.3354/meps12572

Photo courtesy of S. Archer & A. Dunham

Photo courtesy of S. Archer & A. Dunham